

# AFRL

THE AIR FORCE RESEARCH LABORATORY



## About the Directed Energy Directorate

Located at Kirtland Air Force Base, N.M., the Directed Energy Directorate is the Air Force's center of expertise for directed energy and optical technologies. The Directorate focuses on four research areas: Laser Systems, High Power Electromagnetics, Weapons Modeling, Simulation and Analysis, and Directed Energy and Electro-Optics for Space Superiority. The Directorate consists of 700 plus military, civilian, and on-site contractors dedicated to providing the Air Force with game-changing technology.

The Directorate operates on 4,325 acres of land with over 860,000 square feet of laboratory and office space. In addition to the numerous state-of-the-art research laboratories and testing structures at Kirtland AFB, unique facilities on Kirtland include the Starfire Optical Range, the Environmental Laser Test Facility, the High Energy Microwave Laboratory where we do high energy microwave testing inside the anechoic chamber, and the Air Force Maui Optical and Supercomputing site in Hawaii.

### Core Technical Competencies (CTC)

There are four technical competencies at the center of all research and development in the Directed Energy Directorate. In each area, the Directorate has world-class personnel, equipment, and facilities that provide directed energy capabilities for the warfighter.

#### High Power Electromagnetics

- Non-lethal counter-electronics technology (disrupt critical electronic systems)
- Advanced pulsed power components and systems
- High power electromagnetic effects and predictive modeling
- High power microwave (HPM) sources

#### Laser Systems

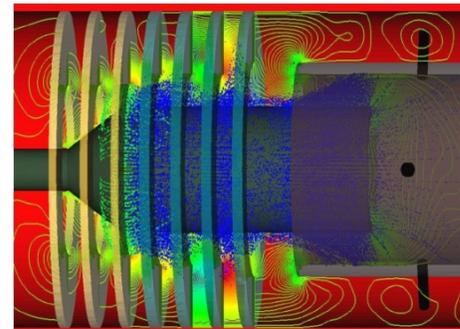
- Future offensive and defensive laser concepts
- Advanced beam control
- Gas, solid-state, and fiber laser sources
- Laser effects and predictive modeling

#### Directed Energy and Electro-Optics for Space Superiority

- Space Situational Awareness
- Track and image space objects from ground-based telescopes
- Adaptive optic technologies to compensate for atmospheric distortions

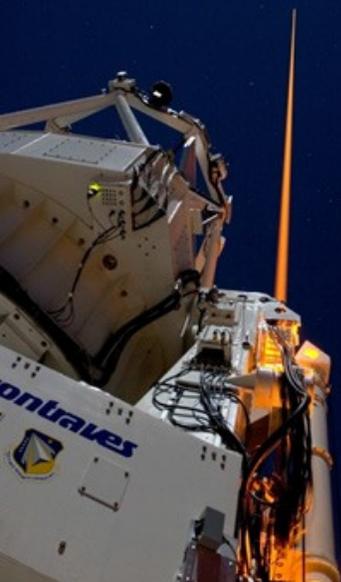
#### Weapons Modeling, Simulation & Analysis

- Concept analysis
- Model synergy of directed energy and kinetic weapons at mission level
- Computer modeling saves time, lowers costs, and provides warfighter with predictive capabilities



Directed  
Energy  
Directorate

Speed of  
Light to the  
Fight by 2020



The Directorate is organized into divisions by major technology area. Often, research capabilities are drawn from several divisions as well as across the whole of AFRL. The four technology divisions are:

**High Power Electromagnetics Division:** Research includes High Power Microwave systems that disable electronic infrastructures with little to no collateral damage, research on novel sources, and compact pulsed power.

**Laser Division:** Research includes advancing high power laser sources, beam control technology, laser modeling and simulation, and laser effects testing, with the goal of integrating and demonstrating laser weapon systems to protect aircraft, airbases, and people.

**Space Electro-Optics Division:** Research includes improving optical and imaging systems using non-traditional and meter class telescopes to provide increased capability to the nation to view objects in space, as well as atmospheric compensation, optical communications, satellite vulnerability analysis, and guidestar technology.

**Mission Planning and Support Division:** Performs analysis of future concepts and mission and battle level model development to assess the impact of directed energy in Air Force wargaming activities.

### Recent Directed Energy Successes

- Accomplished a major step towards 24/7 space situational awareness by collecting the first-ever daytime images of a satellite using a sodium laser guide star adaptive optics system to compensate for atmospheric distortions in real time
- Achieved a significant milestone in the maturation of high power laser weapon system technologies when we conducted the first successful downrange propagation of laser energy from the 150kW-class Demonstrator Laser Weapon System
- Completed Phase I of the Hybrid Defense of Restricted Airspace (HyDRA) Study to assess directed energy utility for area/point defense, which resulted in Air Force experimentation activities for counter unmanned aerial vehicle (UAV) threats
- Demonstrated an operationally relevant period of pulse transmission for our CHAMP assets. Two residual CHAMP test articles were used to demonstrate missiles capable of performing counter-electronics missions. The CHAMP missile disables electronic devices without causing collateral damage to facilities or harm to people

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